ENVIRONMENTAL NOISE ANALYSIS

RDO AGGREGATE PROCESSING SITE
Rancho Cordova, California

BBA Project No. 05-253

Prepared For

Granite Construction Company
P.O. Box 15287
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INTRODUCTION

Granite Construction proposes to develop an aggregate mining operation on rural property located at 12300 White Rock Road in the City of Rancho Cordova, CA. The project site is located south of the main Aerojet property, and is adjacent to aggregate mining projects operated by Teichert, Inc.

The project would include operation of a portable aggregate plant consisting of crushers and screens, along with associated conveyors and loaders. The mining activity would employ front end loaders, wheel-tractor scrapers and bulldozers. Although it is not proposed at this time, it is possible for the project site to accommodate an asphalt batch plant and a concrete batch plant. This equipment would produce noise that could affect the compatibility of nearby noise-sensitive land uses. Operations could occur at any time of the 24-hour day.

The portable aggregate plant could be located on any portion of the project site as development progresses to minimize haul distances. The mining activities could also occur on nearly any portion of the project site, as the dredger tailing piles that comprise the aggregate source are spread over most of the project site.

Appendix A provides definition of the acoustical terminology used in this report. Unless otherwise stated, all sound levels reported in this analysis are A-weighted sound pressure levels in decibels (dB). A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards utilize A-weighted sound levels, as they correlate well with public reaction to noise.

SIGNIFICANCE CRITERIA

Local Regulations

The City of Rancho Cordova currently applies the Sacramento County Zoning Ordinance and other relevant noise standards to projects within the city limits. The Sacramento County Code, Section 235-60, states that:

"Unless otherwise provided by ordinance, the sound level created by the mining use at the boundary line of the authorized mining area shall not exceed 70 dBA except along a boundary contiguous to another area authorized to mine for sand or aggregates. A violation of the noise standard will occur if the noise level at the property line exceeds:

> (a) The noise limit for a cumulative period of more than thirty minutes in any hour, or;
>
> (b) The noise limit plus 5 dBA for a cumulative period of more than one minute in any hour, or the noise limit plus 20 dBA for any period of time."

For continuously-operating noise sources, subsection (a) of this noise standard effectively applies to the median noise level measured for a given noise source. In this analysis, the predicted average noise level (L_{eq}) due to the project noise sources will be compared to the 70 dBA noise standard.

Significance of Changes in Ambient Noise Levels

Some guidance as to the significance of changes in ambient noise levels is provided by the 1992 findings of the Federal Interagency Committee on Noise (FICON), which assessed the annoyance effects of changes in ambient noise levels resulting from aircraft operations. The FICON recommendations are based upon studies that relate aircraft and traffic noise levels to the percentage of persons highly annoyed by the noise. Annoyance is a summary measure of the general adverse reaction of people to noise that generates speech interference, sleep disturbance, or interference with the desire for a tranquil environment.

The rationale for the FICON recommendations is that it is possible to consistently describe the annoyance of people exposed to transportation noise in terms of DNL. The changes in noise exposure that are shown in Table II are expected to result in equal changes in annoyance at sensitive land uses. Although the FICON recommendations were specifically developed to address aircraft noise impacts, they are used in this analysis for traffic noise described in terms of DNL.

TABLE II
MEASURES OF SUBSTANTIAL INCREASE FOR TRANSPORTATION NOISE EXPOSURE

Ambient Noise Level Without Project (DNL)	Significant Impact Assumed to Occur if the Project Increases Ambient Noise Levels By:
<60 dB	+ 5 dB or more
60-65 dB	+3 dB or more
>65 dB	+1.5 dB or more

Source: FICON, 1992, as applied by Brown-Buntin Associates, Inc. (BBA).

For non-transportation noise sources affecting noise sensitive land uses, an increase in ambient noise levels of 5 dBA is usually considered to be potentially significant.

Construction Noise Levels

Noise due to construction activities may be considered to be insignificant if:

- the construction activity is temporary;
- use of heavy equipment and noisy activities is limited to daytime hours;
- no pile driving or surface blasting is planned; and
- all industry-standard noise abatement measures are implemented for noise-producing equipment.

NOISE IMPACT ASSESSMENT

Ambient Noise Levels

To describe the ambient noise levels in the vicinity of the project, BBA conducted continuous and short-term noise level measurements.

Noise measurement equipment consisted of Larson Davis Laboratories (LDL) Model 820 precision integrating sound level meters equipped with a B&K Type 4176 ½" microphones. The sound level meters were calibrated immediately before use, and meet the specifications of the American National Standards Institute (ANSI) for Type 1 sound measurement systems.

The continuous noise measurement location was near the Bi-Dri Study Area, as shown by Figure 1. Figure 2 shows the results of the hourly noise level measurements on November 22-23, 2005. The measured DNL value was 57.1 dB. Ambient noise levels were affected by traffic on White Rock Road, cattle and aircraft overflights. Nighttime noise levels were lower than daytime noise levels, with background noise levels (L_{90}) as low as 28 dB. Ambient noise sources included cattle vocalizations, distant traffic, aircraft overflights and distant mining operations.

As noted above, aircraft fly over or near the project site on approach to, or in the touch-and-go pattern for, Mather Airport. BBA requested an analysis of aircraft flight tracks for Mather Airport from the Sacramento County Airport System for the period of the long-term noise measurements. The results of that analysis are shown by Appendix B, and indicate that 107 Mather Airport aircraft operations occurred in the vicinity of the project site during the time of 10 a.m. November 22, 2005, to 11 a.m. November 23, 2005. The flights were generally spread over a corridor about 2 miles wide. The majority of the aircraft altitudes were in the range of 1100-1400 feet MSL. The aircraft in the vicinity of the project site included a wide range of single- and twin-engine propeller aircraft and about 18 jet aircraft, including 11 transportation category aircraft. None of the loudest noise events recorded at the noise monitoring site were correlated with aircraft operations, but were likely due to cattle vocalizations. Based upon the ambient noise measurements, the aircraft noise exposure at the project site does not appear to be significant for the project at this time, but the presence of aircraft overflights could be of concern to any future sensitive land uses.

Existing traffic noise along White Rock Road was quantified using a combination of noise measurements and traffic noise modeling. The traffic noise measurement was performed approximately 50 feet from the centerline of White Rock Road to calibrate the Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA-RD-77-108) for traffic noise near that roadway.

The U.S. DOT Traffic Noise Model (TNM) was employed for the prediction of traffic noise levels. The TNM is the analytical method currently favored for traffic noise prediction by most state and local agencies. It is applied to federal and state roadway projects by the California Department of Transportation (Caltrans). The model is based upon the CALVENO noise emission factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site.

The TNM was developed to predict hourly L_{eq} values for free-flowing traffic conditions, and is considered to be accurate within 1.5 dB. To predict DNL values, it is necessary to determine the day/night distribution of traffic and to adjust the traffic volume input data to yield an equivalent hourly traffic volume.

The short-term traffic noise level measurement was conducted on November 22, 2005. The purpose of the noise measurement was to determine the accuracy of the TNM in predicting traffic noise for the roadway affecting the project site. The temperature was in the range of 70 degrees Fahrenheit, and the sky was clear. Humidity was low, and wind was approximately 0-5 mph. A traffic count was conducted during the measurement period.

The noise measurement was conducted in terms of the L_{eq}, and the measured value was later compared to the value predicted by the TNM using the observed traffic volume, speed, and distance to the microphone. Table III compares the measured and modeled noise levels for the observed traffic conditions.

TABLE III
NOISE MEASUREMENT SUMMARY AND TNM CALIBRATION

Roadway	Vehicles per Hour			Posted Speed (mph)	Distance (feet)*	Measured L_{eq}, dB	Modeled L_{eq}, dB**
	Autos	Medium Trucks	Heavy Trucks				
White Rock Road	104	0	40	55	50	65.3	66.6

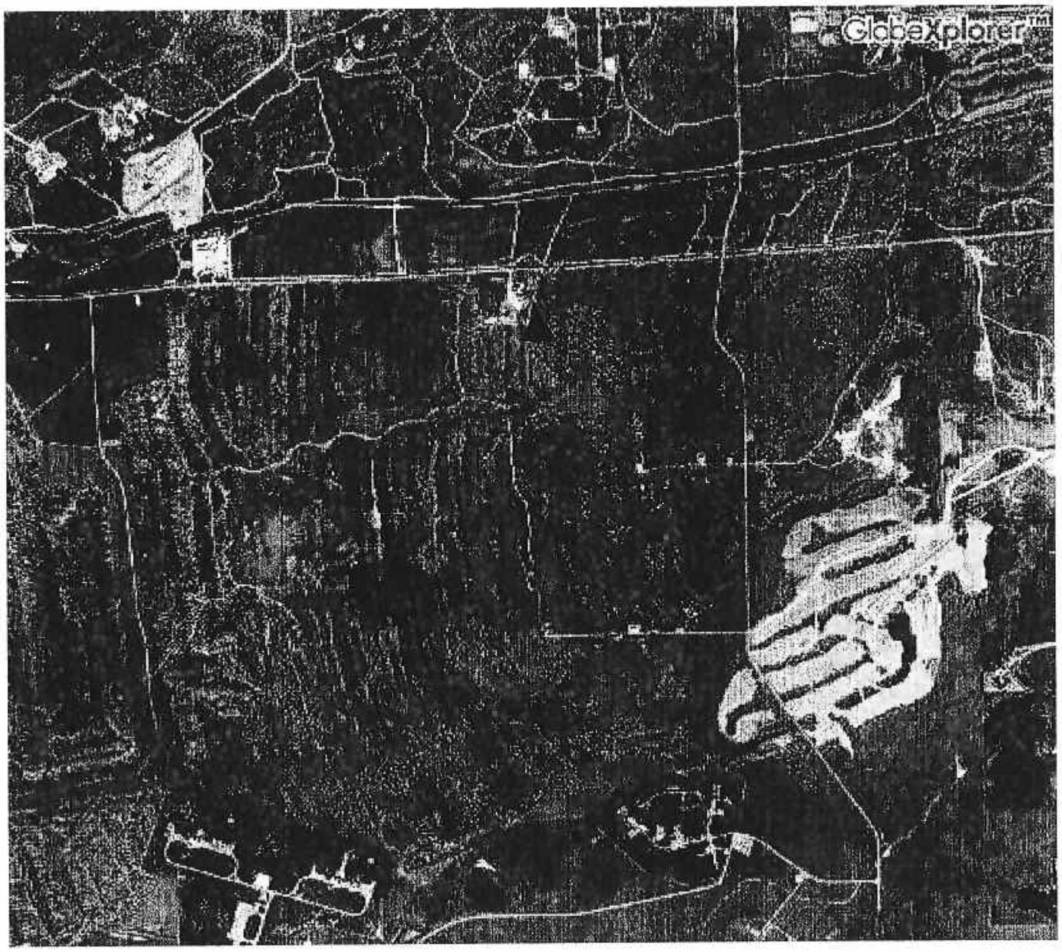
* Distance is measured from the roadway centerline.
** Acoustically "soft" site assumed

The TNM over-predicted the measured average noise levels for traffic on White Rock Road by 1.3 dB. This is a reasonable discrepancy considering the relatively low traffic volume.

For the traffic noise impact analysis, it was assumed that worst-case noise exposures would occur at a reference distance of 50 feet from the centerline of the arterial roadways. Existing traffic volume and truck mix for White Rock Road were estimated from the short-term traffic counts. Granite has projected 273 average daily truck trips for this project. This truck traffic volume was added to the existing traffic to represent existing plus project conditions. Day-night distribution of traffic noise was estimated to be 90%/10%, based on the ambient noise measurement data collected November 22-23, 2005.

The TNM was run to predict existing and future traffic noise levels for White Rock Road. Table IV lists the TNM traffic volume input assumptions and the predicted noise levels at the reference distance of 50 feet from the roadway centerline.

Figure 1
Continuous Noise Measurement Site



▲ Ambient Noise Measurement Site 11/22-23/05

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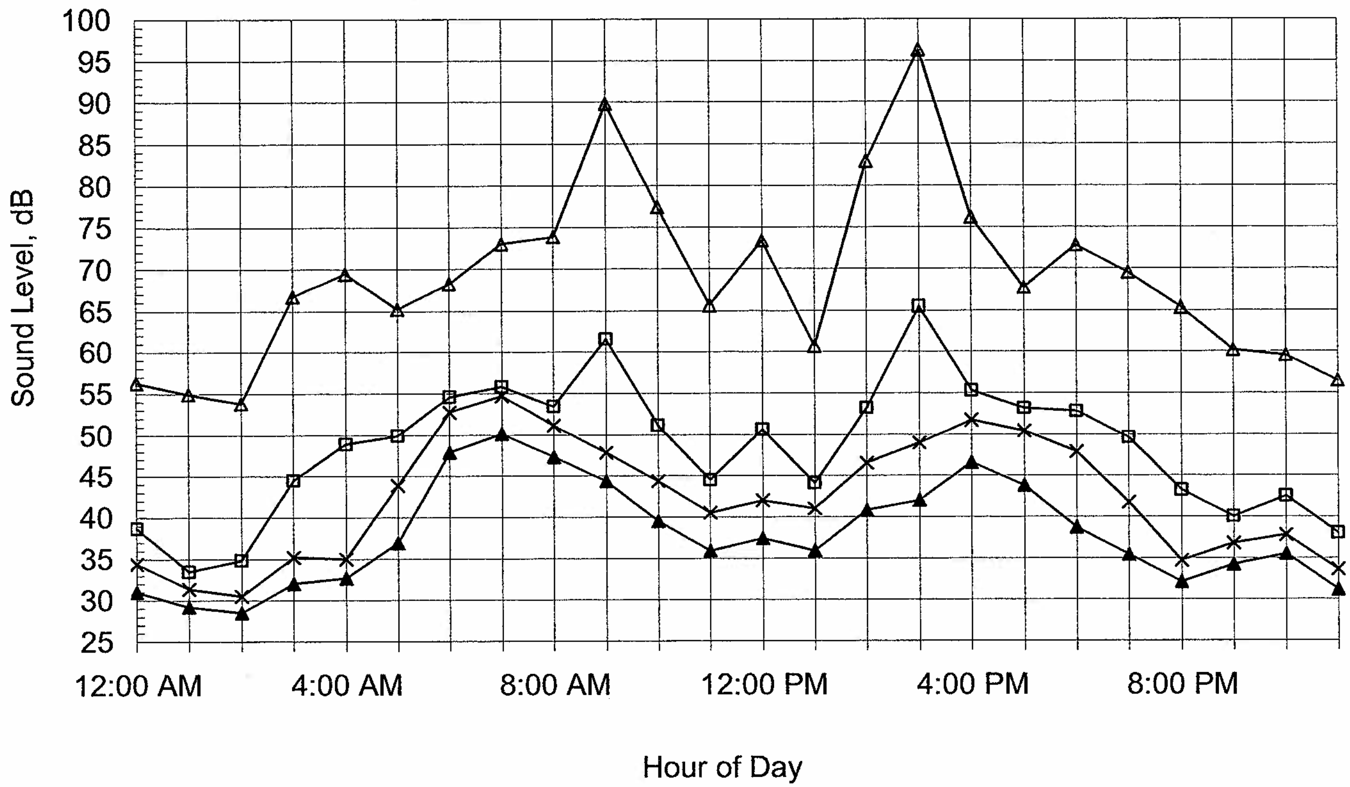
Figure 2: Measured Hourly Noise Levels

12300 White Rock Road

11/22-23/05



Ldn = 57.1 dB

TABLE IV NOISE MODELING ASSUMPTIONS AND RESULTS FOR EXISTING TRAFFIC						
Roadway	Segment	ADT	% Med. Trucks	% Heavy Trucks	Speed	DNL, dB at 50 feet
White Rock Road	Project Site	Existing: 3500	5	20	55	68.4
		Existing plus Project: 3773	5	26	55	69.5

Based upon the traffic noise analysis, the project would result in an increase in existing traffic noise levels of about 1.1 dB for noise sensitive receivers located along White Rock Road. This would be considered an insignificant change in traffic noise levels for sensitive receivers. There are no noise sensitive receivers along this roadway at this time that would be affected by the change, so the noise impact would be insignificant.

Project Noise Levels

The project would include operation of a portable aggregate plant consisting of crushers and screens, along with associated conveyors and loaders. The mining activity would employ front end loaders, wheel-tractor scrapers and bulldozers. Although it is not proposed at this time, it is possible for the project site to accommodate an asphalt batch plant and a concrete batch plant. This equipment would produce noise that could affect the compatibility of nearby noise-sensitive land uses. Operations could occur at any time of the 24-hour day.

The portable aggregate plant could be located on any portion of the project site as development progresses to minimize haul distances. The mining activities could also occur on nearly any portion of the project site, as the dredger tailing piles that comprise the aggregate source are spread over most of the project site.

To prepare a noise contour map, it was assumed that the aggregate plant equipment would be located in the north central portion of the project site, approximately at grade with White Rock Road. The mining activities were assumed to be located in the south central portion of the project site.

BBA employed the Environmental Noise Model (ENM) to predict noise levels produced by the proposed processing and mining operations. The ENM is a commercially-available noise prediction model that accounts for sound propagation over distance, considering sound absorption by the air and ground, as well as the effects of barriers, applying internationally accepted algorithms.

Noise source data were derived from BBA file data collected for other Granite processing and mining equipment, supplemented by other file data for typical loaders and elevating scrapers. Specifically, the equipment included in the noise modeling included:

- Portable aggregate processing plant
- Material separation screens

- Cat 988 front loader at processing plant
- Cat 631 Wheel Tractor Scrapers (4)
- Cat D9 Bulldozer
- Portable asphalt batch plant (not proposed at this time)
- Portable concrete batch plant (not proposed at this time)

For the noise modeling, the processing equipment was distributed over a concentrated area in the approximate center of the designated processing plant site. Mining activity was modeled in the lower center of the project site. The ENM was used to produce hourly average noise level (L_{eq}) contours in the range of 60 to 75 dB for typical operating conditions. The resulting noise contours are shown by Figure 3, superimposed on a generalized base map derived from the AutoCAD site drawings provided by Granite.

The noise contours may be used to develop recommended setbacks to ensure that the City noise standards are satisfied. Specifically, the noise standard of 70 dBA at the property line of non-mining uses can be satisfied by locating the processing plant equipment so that the 70 dB L_{eq} contour lies within the north property boundary, which is about 600 feet from the center of processing operations. Similarly, noise from mining operations can be maintained at less than 70 dBA by setting back mining activity about 100 feet from the north property line. Note that these setbacks are only required along White Rock Road, since the adjacent land uses on the other three sides of the project site are mining-related.

MITIGATION MEASURES

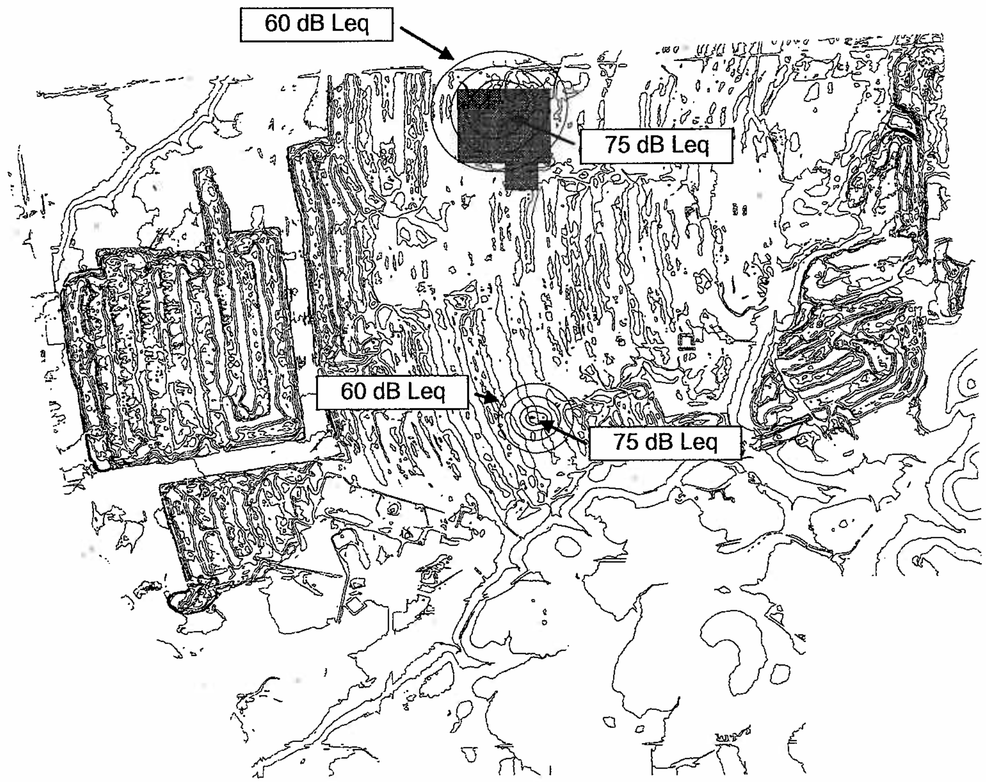
The project is not expected to result in significant noise impacts, given the generalized project site plan and the existing land uses adjacent to the project site. However, to ensure that the City of Rancho Cordova noise standards are satisfied, the following noise mitigation measures are recommended:

1. Aggregate processing equipment should be located about 600 feet south of White Rock Road, unless noise mitigation measures are provided. Suitable measures would include temporary barriers such as earth berms about 8 feet in height, or as otherwise required to intercept line of sight from the noise sources to the receivers.
2. Mining activities should be set back about 100 feet from White Rock Road, unless noise mitigation measures are provided. Suitable measures would include temporary barriers such as earth berms about 8 feet in height, or as otherwise required to intercept line of sight from the noise sources to the receivers.

Respectfully submitted,
Brown-Buntin Associates, Inc.

Jim Buntin
Vice President

Figure 3
Predicted Locations of Average Hourly Noise Level Contours
Granite RDO Project Site



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APPENDIX A

ACOUSTICAL TERMINOLOGY

AMBIENT NOISE LEVEL: The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

CNEL: Community Noise Equivalent Level. The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.

DECIBEL, dB: A unit for describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).

DNL/L_{dn}: Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition of ten decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.

L_{eq}: Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. L_{eq} is typically computed over 1, 8 and 24-hour sample periods.

NOTE: The CNEL and DNL represent daily levels of noise exposure averaged on an annual basis, while L_{eq} represents the average noise exposure for a shorter time period, typically one hour.

L_{max}: The maximum noise level recorded during a noise event.

L_n: The sound level exceeded "n" percent of the time during a sample interval (L_{90}, L_{50}, L_{10}, etc.). For example, L_{10} equals the level exceeded 10 percent of the time.

ACOUSTICAL TERMINOLOGY

NOISE EXPOSURE CONTOURS: Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and DNL contours are frequently utilized to describe community exposure to noise.

NOISE LEVEL REDUCTION (NLR): The noise reduction between indoor and outdoor environments or between two rooms that is the numerical difference, in decibels, of the average sound pressure levels in those areas or rooms. A measurement of "noise level reduction" combines the effect of the transmission loss performance of the structure plus the effect of acoustic absorption present in the receiving room.

SEL or SENEL: Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to a duration of one second. More specifically, it is the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on a reference pressure of 20 micropascals and a reference duration of one second.

SOUND LEVEL: The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.

SOUND TRANSMISSION CLASS (STC): The single-number rating of sound transmission loss for a construction element (window, door, etc.) over a frequency range where speech intelligibility largely occurs.